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META-ANALYTIC EVIDENCE OF DECISION TASK EFFECTS AND THEIR EFFECT ON SEARCH OUTCOMES SUBJECT TO HUMAN-COMPUTER INTERACTIONS IN THE CONTEXT OF WEB PAGE SEARCH

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Abstract

Web page customization is receiving significant attention in Management Information Systems practice, as website principals scramble to learn about their visitors from the nature of their activity on the site. These and other considerable efforts to learn about users are requisite to manipulating site characteristics and measuring resulting search outcomes based on user activity. Even when we know why web page information should be changed, we still do not know what to change in order to help users' search for information. Empirical variances across similar tasks have complicated our search for a small set of underlying principles that can describe human decision-making behaviors (Payne 1982). That is, we lack generalized empirical evidence of the expected effectiveness of web page customizations. This report describes work on a meta-analytic study of the relationships between decision task effects and individual search behaviors in the context of web page usage.

Problem Statement

Web page customization is receiving significant attention in Management Information Systems practice, as website principals scramble to learn about their visitors from the nature of their activity on the site. These and other considerable efforts to learn about users are requisite to manipulating site characteristics and measuring user behaviors. Even when we know *why* web page information should be changed, we still do not know *what* to change in order to help users' search for information. Empirical variances across similar tasks have complicated our search for a small set of underlying principles that can describe human decision-making behaviors (Payne 1982). That is, we lack generalized empirical evidence of the expected effectiveness of web page customizations. This report describes work on a meta-analytic study of the relationships between decision task effects and individual search behaviors in the context of web page usage.

Three Research Questions

Sound marketing strategies take into account the nature of a potential customer's search for information prior to a product choice (Hawkins, Best and Coney 1995; p456). In turn, information processing in individual decision-making is highly contingent upon the situational demands of the task (Payne 1982). These findings suggest three major questions concerning the expected effectiveness of web page customizations. First, which interpretive framework (and its associated tactics) suits our web search context best? Payne's 1982 review of Contingent Decision Behavior presents alternative frameworks studied in the literature. Second, which (jointly measured) variables should be manipulated to influence web search behavior? Payne's review also provides a hierarchy of empirically supported variables that explain task dependent information processing. And third, what situations amplify or dampen the effect of these manipulated variables? Hypertext and Human-Computer Interaction studies recommend four potential moderators of search and media effectiveness.

Research Question 1

To choose an alternative interpretive framework in the context of web search, we can concentrate on crucial (as contemplated by Platt 1964) predictions that differ for each framework and accept the one that fits a single data set best. Here, the crucial prediction regards the role of individual variability. A **cost/benefit** framework predicts large individual variability in search behavior as particular users consider their probability of a "correct" decision, the speed of making the decision, and its computational costs (Beach and Mitchell 1978). In contrast, a **human perception** framework predicts less observed individual variability as normally unconscious and essentially "hardwired" evolutionary adaptations govern the collection and processing of information (Kahneman and Tversky 1979; Tversky & Kahneman, 1981). Table 1 presents Payne's constructs and measures together with our operationalization of individual variability. Note that *Context Effects* shown are more dependent on individual perceptions than the values of *Task Effects* (Payne 1982), so we include them as individual variability. We also include Payne's time pressure or agenda constraints (the order in which elements of a choice set are considered) because they should be irrelevant in the web search context; hypertext users can dynamically determine access to information to suit their own needs (Jonassen, 1988). The choice of frameworks has great impact. For example, website principals adopting the cost/benefit perspective might concentrate on consumer *recognition* of informative product labeling, while website principals adopting a human perception interpretation would concentrate on consumer *recall* of psychological and affective brand imaging.

Research Question 2

The primary focus of decision research should now be the search for some general principles from which contingent processing would follow (Payne 1982); in addition to addressing research question 1, we want to know *which Task Effect* measures and constructs generally explain web search behaviors best. Thus, the focus of this study is a three-level hierarchical multivariate mixed model for meta-analysis (Kalaian and Raudenbush 1996). The major features of our model addresses three aspects of research question 2 and allow tests of research question 1.

Level 1 of our model captures the causal relationships between subsets of factors contained in Figure 1 for website principals interested in standardized meta-analytic data summarized over many studies. Level 2 of our model captures the generalized effects of different Level 1 measures together with other random variations across experiments in Marketing, Human-Computer Interaction, Management, Psychology and Management Information Systems. Finally, Level 3 captures the explanatory power of the jointly measured theoretical constructs (*Task Complexity*, *Response Mode*, and *Information Display*) shown in Table 1. A multivariate model considers joint effects on all our dependents. And finally, after accounting for the variance represented by Levels 1, 2, and 3 above, our mixed (rather than fixed) model produces a measure of a residual, random individual variance component to test in connection with research question one.

Research Question 3

In general terms, a moderator is a variable that affects the direction and or strength of the relation between independent and dependent variable(s) (Baron and Kenny 1986). Website principals need to know the situations governing the direction and strength of these factors in the web search domain. This study proposes four moderators representing the impact of Human-Computer Interaction upon the relationship between *Task Effects* and search behaviors.

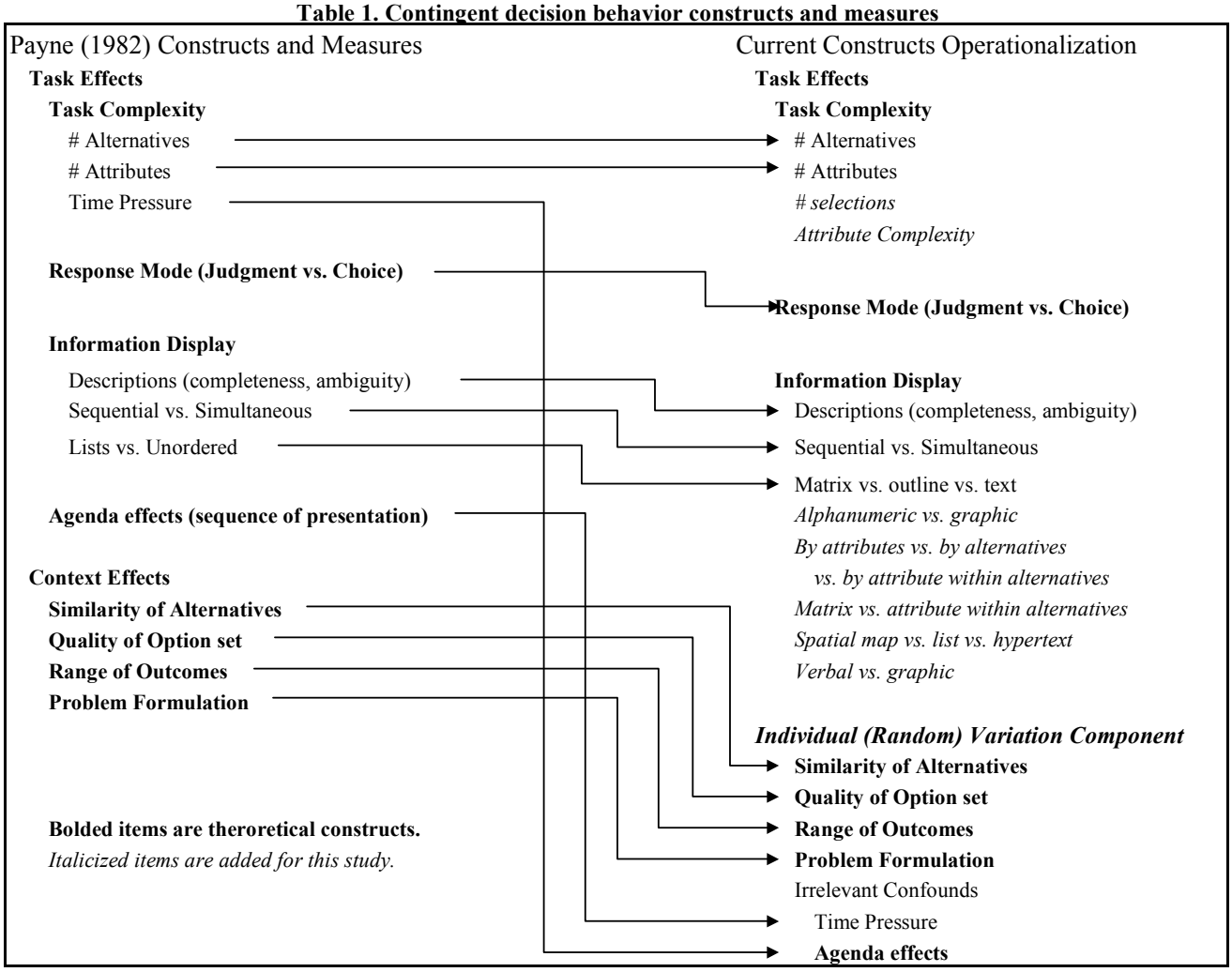
Knowledge Research findings across various domains support two generalizations about the effects of category knowledge on information processing: 1) information matches to a category trigger heuristics that cue solutions typical of the matched category, and 2) expertise seems to be linked to knowledge of categories and rapid recognition of patterns that would otherwise need to be examined analytically (Sujan 1985).

Involvement. Decision involvement as the degree of information processing (Greenwald & Leavitt 1984) impacts observed search behaviors.

Spatial Ability. Campagnoni and Ehrlich (1989) found that individuals with high spatial visualization scores tended to be efficient hypertext knowledge base searchers because they maintain their orientation while browsing with a cognitive map of information in a spatial arrangement.

Media. Although browsing in hypertext is often thought of as meandering through information, hypertext enhanced search of information, is a technological answer to an unabridged human curiosity for more information (Dochastel, 1990).

Table 1. Contingent decision behavior constructs and measures



Measures of Search Behaviors

Web searchers may seek information on appropriate evaluative criteria, alternative solutions to a problem, or the performance of each alternative solution (Hawkins, Best and Coney 1995; p451). Previous research suggests that these strategies may be inferred from monitoring the pattern and amount of information acquired by decision makers (Johnson and Meyer 1984; Lussier and Olshavsky 1979; Payne 1976; Payne, Bettman, and Johnson 1988). Exploratory scanning for evaluative criteria is indicated by wide search scope with less depth. Scanning for alternative solutions is indicated by examination of many attributes across a few alternatives. And scanning for evaluation of performance is indicated by attention to a few attributes across many alternatives (Johnson, Meyer and Ghose 1989). Web principals might use these characterizations to infer whether their own offering is currently under consideration by a user; a search for alternative solutions suggests that the targeted product is not within the user's evoked choice set, while a search for performance attributes may suggest otherwise. Different market strategies may be appropriate depending on the user's level of search and whether he has already considered a targeted product; principals might attempt "capture" or "intercept" strategies for limited search users depending on whether the targeted product is considered or not, and so on (Hawkins, Best and Coney 1995; p456).

Here, then, is the potential utility of studies such as this one; with generalized empirical evidence on the effectiveness of web page customizations, website principals might seek to increase the possibility that web searches include targeted products, to customize their marketing online depending on whether their product is being considered, or to provide a public service to website visitors in the form of easy to find information appropriate for the decision at hand.

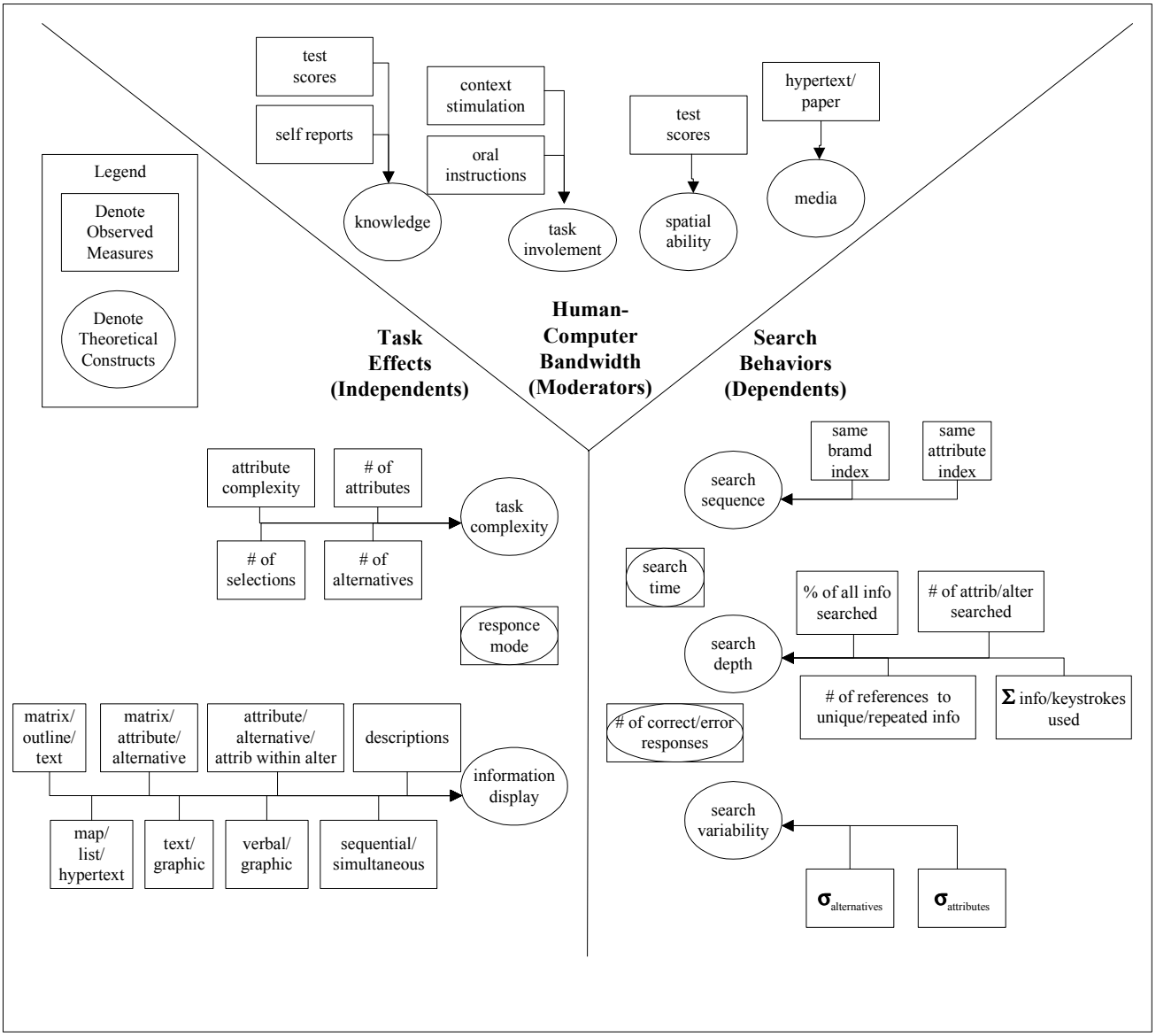


Figure 1. Operational Model

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